



-120-

SEQUENCE LISTING

(1) GENERAL INFORMATION:

- T1210X
- (i) APPLICANT: Deboer, Herman A.  
Strijker, Rein  
Heyneker, Herbert L.  
Platenburg, Gerald  
Lee, Sang He  
Pieper, Frank  
Krimpenfort, Paul J.A.
  - (ii) TITLE OF INVENTION: Production of Recombinant Polypeptides  
by Bovine Species and Transgenic Methods
  - (iii) NUMBER OF SEQUENCES: 38
  - (iv) CORRESPONDENCE ADDRESS:
    - (A) ADDRESSEE: Townsend and Townsend and Crew
    - (B) STREET: One Market Plaza, Steuart Tower, Suite 2000
    - (C) CITY: San Francisco
    - (D) STATE: California
    - (E) COUNTRY: USA
    - (F) ZIP: 94105
  - (v) COMPUTER READABLE FORM:
    - (A) MEDIUM TYPE: Floppy disk
    - (B) COMPUTER: IBM PC compatible
    - (C) OPERATING SYSTEM: PC-DOS/MS-DOS
    - (D) SOFTWARE: PatentIn Release #1.0, Version #1.25
  - (vi) CURRENT APPLICATION DATA:
    - (A) APPLICATION NUMBER: US 08/476,798
    - (B) FILING DATE: 07-JUN-1995
    - (C) CLASSIFICATION:
  - (vii) PRIOR APPLICATION DATA:
    - (A) APPLICATION NUMBER: US 08/077,788
    - (B) FILING DATE: 15-JUN-1993
  - (vii) PRIOR APPLICATION DATA:
    - (A) APPLICATION NUMBER: US 07/895,956
    - (B) FILING DATE: 15-JUN-1992
  - (vii) PRIOR APPLICATION DATA:
    - (A) APPLICATION NUMBER: US 07/619,131
    - (B) FILING DATE: 27-NOV-1990
  - (vii) PRIOR APPLICATION DATA:
    - (A) APPLICATION NUMBER: US 07/444,745
    - (B) FILING DATE: 01-DEC-1989

121

(viii) ATTORNEY/AGENT INFORMATION:

- (A) NAME: Liebescheutz, Joe O.
- (B) REGISTRATION NUMBER: 37,505
- (C) REFERENCE/DOCKET NUMBER: 16994-003125

(ix) TELECOMMUNICATION INFORMATION:

- (A) TELEPHONE: 415-543-9600
- (B) TELEFAX: 415-543-5043

(2) INFORMATION FOR SEQ ID NO:1:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 2319 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(ix) FEATURE:

- (A) NAME/KEY: sig\_peptide
- (B) LOCATION: 1..54

(ix) FEATURE:

- (A) NAME/KEY: mat\_peptide
- (B) LOCATION: 55..2130

(ix) FEATURE:

- (A) NAME/KEY: CDS
- (B) LOCATION: 1..2130

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:1:

GGA CTT GTC TTC CTC GTC CTG CTG TTC CTC GGG GCC CTC GGA CTG TGT	48
Gly Leu Val Phe Leu Val Leu Leu Phe Leu Gly Ala Leu Gly Leu Cys	
-18 -15 -10 -5	
CTG GCT GGC CGT AGG AGA AGG AGT GTT CAG TGG TGC GCC GTA TCC CAA	96
Leu Ala Gly Arg Arg Arg Arg Ser Val Gln Trp Cys Ala Val Ser Gln	
1 5 10	
CCC GAG GCC ACA AAA TGC TTC CAA TGG CAA AGG AAT ATG AGA AAA GTG	144
Pro Glu Ala Thr Lys Cys Phe Gln Trp Gln Arg Asn Met Arg Lys Val	
15 20 25 30	
CTG GGC CCT CCT GTC AGC TGC ATA AAG AGA GAC TCC CCC ATC CAG TGT	192
Leu Gly Pro Pro Val Ser Cys Ile Lys Arg Asp Ser Pro Ile Gln Cys	
35 40 45	
ATC CAG GCC ATT GCG GAA AAC AGG GCC GAT GCT GTG ACC CTT GAT GGT	240
Ile Gln Ala Ile Ala Glu Asn Arg Ala Asp Ala Val Thr Leu Asp Gly	
50 55 60	
GGT TTC ATA TAC GAG GCA GGC CTG GCC CCC TAC AAA CTG CGA CCT GTA	288
Gly Phe Ile Tyr Glu Ala Gly Leu Ala Pro Tyr Lys Leu Arg Pro Val	
65 70 75	
GCG GCG GAA GTC TAC GGG ACC GAA AGA CAG CCA CGA ACT CAC TAT TAT	336
Ala Ala Glu Val Tyr Gly Thr Glu Arg Gln Pro Arg Thr His Tyr Tyr	
80 85 90	

CGG	GTG	GCT	GTG	GTG	AAG	AAG	GGC	GGC	AGC	TTT	CAG	CTG	AAC	GAA	CTG	384
Arg	Val	Ala	Val	Val	Lys	Lys	Gly	Gly	Ser	Phe	Gln	Leu	Asn	Glu	Leu	
95					100					105					110	
CAA	GGT	CTG	AAG	TCC	TGC	CAC	ACA	GGC	CTT	CGC	AGG	ACC	GCT	GGA	TGG	432
Gln	Gly	Leu	Lys	Ser	Cys	His	Thr	Gly	Leu	Arg	Arg	Thr	Ala	Gly	Trp	
				115					120					125		
AAT	GTC	CCT	ACA	GGG	ACA	CTT	CGT	CCA	TTC	TTG	AAT	TGG	ACG	GGT	CCA	480
Asn	Val	Pro	Thr	Gly	Thr	Leu	Arg	Pro	Phe	Leu	Asn	Trp	Thr	Gly	Pro	
			130					135					140			
CCT	GAG	CCC	ATT	GAG	GCA	GCT	GTG	CAG	TTC	TTC	TCA	GCC	AGC	TGT	GTT	528
Pro	Glu	Pro	Ile	Glu	Ala	Ala	Val	Gln	Phe	Phe	Ser	Ala	Ser	Cys	Val	
		145					150					155				
CCC	GGT	GCA	GAT	AAA	GGA	CAG	TTC	CCC	AAC	CTG	TGT	CGC	CTG	TGT	GCG	576
Pro	Gly	Ala	Asp	Lys	Gly	Gln	Phe	Pro	Asn	Leu	Cys	Arg	Leu	Cys	Ala	
	160					165					170					
GGG	ACA	GGG	GAA	AAC	AAA	TGT	GCC	TTC	TCC	TCC	CAG	GAA	CCG	TAC	TTC	624
Gly	Thr	Gly	Glu	Asn	Lys	Cys	Ala	Phe	Ser	Ser	Gln	Glu	Pro	Tyr	Phe	
175					180					185					190	
AGC	TAC	TCT	GGT	GCC	TTC	AAG	TGT	CTG	AGA	GAC	GGG	GCT	GGA	GAC	GTG	672
Ser	Tyr	Ser	Gly	Ala	Phe	Lys	Cys	Leu	Arg	Asp	Gly	Ala	Gly	Asp	Val	
				195					200					205		
GCT	TTT	ATC	AGA	GAG	AGC	ACA	GTG	TTT	GAG	GAC	CTG	TCA	GAC	GAG	GCT	720
Ala	Phe	Ile	Arg	Glu	Ser	Thr	Val	Phe	Glu	Asp	Leu	Ser	Asp	Glu	Ala	
			210					215					220			
GAA	AGG	GAC	GAG	TAT	GAG	TTA	CTC	TGC	CCA	GAC	AAC	ACT	CGG	AAG	CCA	768
Glu	Arg	Asp	Glu	Tyr	Glu	Leu	Leu	Cys	Pro	Asp	Asn	Thr	Arg	Lys	Pro	
		225					230					235				
GTG	GAC	AAG	TTC	AAA	GAC	TGC	CAT	CTG	GCC	CGG	GTC	CCT	TCT	CAT	GCC	816
Val	Asp	Lys	Phe	Lys	Asp	Cys	His	Leu	Ala	Arg	Val	Pro	Ser	His	Ala	
	240					245					250					
GTT	GTG	GCA	CGA	AGT	GTG	AAT	GGC	AAG	GAG	GAT	GCC	ATC	TGG	AAT	CTT	864
Val	Val	Ala	Arg	Ser	Val	Asn	Gly	Lys	Glu	Asp	Ala	Ile	Trp	Asn	Leu	
255					260					265					270	
CTC	CGC	CAG	GCA	CAG	GAA	AAG	TTT	GGA	AAG	GAC	AAG	TCA	CCG	AAA	TTC	912
Leu	Arg	Gln	Ala	Gln	Glu	Lys	Phe	Gly	Lys	Asp	Lys	Ser	Pro	Lys	Phe	
				275					280					285		
CAG	CTC	TTT	GGC	TCC	CCT	AGT	GGG	CAG	AAA	GAT	CTG	CTG	TTC	AAG	GAC	960
Gln	Leu	Phe	Gly	Ser	Pro	Ser	Gly	Gln	Lys	Asp	Leu	Leu	Phe	Lys	Asp	
			290					295					300			

TCT	GCC	ATT	GGG	TTT	TCG	AGG	GTG	CCC	CCG	AGG	ATA	GAT	TCT	GGG	CTG	1008
Ser	Ala	Ile	Gly	Phe	Ser	Arg	Val	Pro	Pro	Arg	Ile	Asp	Ser	Gly	Leu	
		305					310					315				
TAC	CTT	GGC	TCC	GGC	TAC	TTC	ACT	GCC	ATC	CAG	AAC	TTG	AGG	AAA	AGT	1056
Tyr	Leu	Gly	Ser	Gly	Tyr	Phe	Thr	Ala	Ile	Gln	Asn	Leu	Arg	Lys	Ser	
	320					325					330					
GAG	GAG	GAA	GTG	GCT	GCC	CGG	CGT	GCG	CGG	GTC	GTG	TGG	TGT	GCG	GTG	1104
Glu	Glu	Glu	Val	Ala	Ala	Arg	Arg	Ala	Arg	Val	Val	Trp	Cys	Ala	Val	
335					340					345					350	
GGC	GAG	CAG	GAG	CTG	CGC	AAG	TGT	AAC	CAG	TGG	AGT	GGC	TTG	AGC	GAA	1152
Gly	Glu	Gln	Glu	Leu	Arg	Lys	Cys	Asn	Gln	Trp	Ser	Gly	Leu	Ser	Glu	
				355					360					365		
GGC	AGC	GTG	ACC	TGC	TCC	TCG	GCC	TCC	ACC	ACA	GAG	GAC	TGC	ATC	GCC	1200
Gly	Ser	Val	Thr	Cys	Ser	Ser	Ala	Ser	Thr	Thr	Glu	Asp	Cys	Ile	Ala	
			370					375					380			
CTG	GTG	CTG	AAA	GGA	GAA	GCT	GAT	GCC	ATG	AGT	TTG	GAT	GGA	GGA	TAT	1248
Leu	Val	Leu	Lys	Gly	Glu	Ala	Asp	Ala	Met	Ser	Leu	Asp	Gly	Gly	Tyr	
		385					390					395				
GTG	TAC	ACT	GCA	TGC	AAA	TGT	GGT	TTG	GTG	CCT	GTC	CTG	GCA	GAG	AAC	1296
Val	Tyr	Thr	Ala	Cys	Lys	Cys	Gly	Leu	Val	Pro	Val	Leu	Ala	Glu	Asn	
	400					405					410					
TAC	AAA	TCC	CAA	CAA	AGC	AGT	GAC	CCT	GAT	CCT	AAC	TGT	GTG	GAT	AGA	1344
Tyr	Lys	Ser	Gln	Gln	Ser	Ser	Asp	Pro	Asp	Pro	Asn	Cys	Val	Asp	Arg	
415					420					425					430	
CCT	GTG	GAA	GGA	TAT	CTT	GCT	GTG	GCG	GTG	GTT	AGG	AGA	TCA	GAC	ACT	1392
Pro	Val	Glu	Gly	Tyr	Leu	Ala	Val	Ala	Val	Val	Arg	Arg	Ser	Asp	Thr	
				435					440					445		
AGC	CTT	ACC	TGG	AAC	TCT	GTG	AAA	GGC	AAG	AAG	TCC	TGC	CAC	ACC	GCC	1440
Ser	Leu	Thr	Trp	Asn	Ser	Val	Lys	Gly	Lys	Lys	Ser	Cys	His	Thr	Ala	
			450					455					460			
GTG	GAC	AGG	ACT	GCA	GGC	TGG	AAT	ATC	CCC	ATG	GGC	CTG	CTC	TTC	AAC	1488
Val	Asp	Arg	Thr	Ala	Gly	Trp	Asn	Ile	Pro	Met	Gly	Leu	Leu	Phe	Asn	
		465					470					475				
CAG	ACG	GGC	TCC	TGC	AAA	TTT	GAT	GAA	TAT	TTC	AGT	CAA	AGC	TGT	GCC	1536
Gln	Thr	Gly	Ser	Cys	Lys	Phe	Asp	Glu	Tyr	Phe	Ser	Gln	Ser	Cys	Ala	
	480					485					490					
CCT	GGG	TCT	GAC	CCG	AGA	TCT	AAT	CTC	TGT	GCT	CTG	TGT	ATT	GGC	GAC	1584
Pro	Gly	Ser	Asp	Pro	Arg	Ser	Asn	Leu	Cys	Ala	Leu	Cys	Ile	Gly	Asp	
495					500					505				510		

125

GAG CAG GGT GAG AAT AAG TGC GTG CCC AAC AGC AAT GAG AGA TAC TAC	1632
Glu Gln Gly Glu Asn Lys Cys Val Pro Asn Ser Asn Glu Arg Tyr Tyr	
515 520 525	
GGC TAC ACT GGG GCT TTC CGG TGC CTG GCT GAG AAT GCT GGA GAC GTT	1680
Gly Tyr Thr Gly Ala Phe Arg Cys Leu Ala Glu Asn Ala Gly Asp Val	
530 535 540	
GCA TTT GTG AAA GAT GTC ACT GTC TTG CAG AAC ACT GAT GGA AAT AAC	1728
Ala Phe Val Lys Asp Val Thr Val Leu Gln Asn Thr Asp Gly Asn Asn	
545 550 555	
AAT GAG GCA TGG GCT AAG GAT TTG AAG CTG GCA GAC TTT GCG CTG CTG	1776
Asn Glu Ala Trp Ala Lys Asp Leu Lys Leu Ala Asp Phe Ala Leu Leu	
560 565 570	
TGC CTC GAT GGC AAA CGG AAG CCT GTG ACT GAG GCT AGA AGC TGC CAT	1824
Cys Leu Asp Gly Lys Arg Lys Pro Val Thr Glu Ala Arg Ser Cys His	
575 580 585 590	
CTT GCC ATG GCC CCG AAT CAT GCC GTG GTG TCT CGG ATG GAT AAG GTG	1872
Leu Ala Met Ala Pro Asn His Ala Val Ser Arg Met Asp Lys Val	
595 600 605	
GAA CGC CTG AAA CAG GTG CTG CTC CAC CAA CAG GCT AAA TTT GGG AGA	1920
Glu Arg Leu Lys Gln Val Leu Leu His Gln Gln Ala Lys Phe Gly Arg	
610 615 620	
AAT GGA TCT GAC TGC CCG GAC AAG TTT TGC TTA TTC CAG TCT GAA ACC	1968
Asn Gly Ser Asp Cys Pro Asp Lys Phe Cys Leu Phe Gln Ser Glu Thr	
625 630 635	
AAA AAC CTT CTG TTC AAT GAC AAC ACT GAG TGT CTG GCC AGA CTC CAT	2016
Lys Asn Leu Leu Phe Asn Asp Asn Thr Glu Cys Leu Ala Arg Leu His	
640 645 650	
GGC AAA ACA ACA TAT GAA AAA TAT TTG GGA CCA CAG TAT GTC GCA GGC	2064
Gly Lys Thr Thr Tyr Glu Lys Tyr Leu Gly Pro Gln Tyr Val Ala Gly	
655 660 665 670	
ATT ACT AAT CGT AAA AAG TGC TCA ACC TCC CCC CTC CTG GAA GCC TGT	2112
Ile Thr Asn Arg Lys Lys Cys Ser Thr Ser Pro Leu Leu Glu Ala Cys	
675 680 685	
GAA TTC CTC AGG AAG TAAAACCGAA GAAGATGGCC CAGCTCCCCA AGAAAGCCTC	2167
Glu Phe Leu Arg Lys	
690	
AGCCATTAC TGCCCCCAGC TCTTCTCCCC AGGTGTGTTG GGGCCTTGGC TCCCCTGCTG	2227
AAGGTGGGGA TTGCCCATCC ATCTGCTTAC AATTCCCTGC TGTCGTCTTA GCAAGAAGTA	2287
AAATGAGAAA TTTTGTGTGAT ATCAAAAAA AA	2319

(2) INFORMATION FOR SEQ ID NO:2:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 709 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:2:

Gly	Leu	Val	Phe	Leu	Val	Leu	Leu	Phe	Leu	Gly	Ala	Leu	Gly	Leu	Cys
-18			-15					-10					-5		
Leu	Ala	Gly	Arg	Arg	Arg	Arg	Ser	Val	Gln	Trp	Cys	Ala	Val	Ser	Gln
		1				5					10				
Pro	Glu	Ala	Thr	Lys	Cys	Phe	Gln	Trp	Gln	Arg	Asn	Met	Arg	Lys	Val
15					20					25					30
Leu	Gly	Pro	Pro	Val	Ser	Cys	Ile	Lys	Arg	Asp	Ser	Pro	Ile	Gln	Cys
				35					40					45	
Ile	Gln	Ala	Ile	Ala	Glu	Asn	Arg	Ala	Asp	Ala	Val	Thr	Leu	Asp	Gly
			50					55					60		
Gly	Phe	Ile	Tyr	Glu	Ala	Gly	Leu	Ala	Pro	Tyr	Lys	Leu	Arg	Pro	Val
		65					70					75			
Ala	Ala	Glu	Val	Tyr	Gly	Thr	Glu	Arg	Gln	Pro	Arg	Thr	His	Tyr	Tyr
	80					85					90				
Arg	Val	Ala	Val	Val	Lys	Lys	Gly	Gly	Ser	Phe	Gln	Leu	Asn	Glu	Leu
95					100					105					110
Gln	Gly	Leu	Lys	Ser	Cys	His	Thr	Gly	Leu	Arg	Arg	Thr	Ala	Gly	Trp
				115					120					125	
Asn	Val	Pro	Thr	Gly	Thr	Leu	Arg	Pro	Phe	Leu	Asn	Trp	Thr	Gly	Pro
			130					135					140		
Pro	Glu	Pro	Ile	Glu	Ala	Ala	Val	Gln	Phe	Phe	Ser	Ala	Ser	Cys	Val
		145					150					155			
Pro	Gly	Ala	Asp	Lys	Gly	Gln	Phe	Pro	Asn	Leu	Cys	Arg	Leu	Cys	Ala
	160					165					170				
Gly	Thr	Gly	Glu	Asn	Lys	Cys	Ala	Phe	Ser	Ser	Gln	Glu	Pro	Tyr	Phe
175					180					185					190
Ser	Tyr	Ser	Gly	Ala	Phe	Lys	Cys	Leu	Arg	Asp	Gly	Ala	Gly	Asp	Val
				195					200					205	

Ala	Phe	Ile	Arg	Glu	Ser	Thr	Val	Phe	Glu	Asp	Leu	Ser	Asp	Glu	Ala
			210					215					220		
Glu	Arg	Asp	Glu	Tyr	Glu	Leu	Leu	Cys	Pro	Asp	Asn	Thr	Arg	Lys	Pro
		225					230					235			
Val	Asp	Lys	Phe	Lys	Asp	Cys	His	Leu	Ala	Arg	Val	Pro	Ser	His	Ala
	240					245					250				
Val	Val	Ala	Arg	Ser	Val	Asn	Gly	Lys	Glu	Asp	Ala	Ile	Trp	Asn	Leu
255					260					265					270
Leu	Arg	Gln	Ala	Gln	Glu	Lys	Phe	Gly	Lys	Asp	Lys	Ser	Pro	Lys	Phe
				275					280					285	
Gln	Leu	Phe	Gly	Ser	Pro	Ser	Gly	Gln	Lys	Asp	Leu	Leu	Phe	Lys	Asp
			290					295					300		
Ser	Ala	Ile	Gly	Phe	Ser	Arg	Val	Pro	Pro	Arg	Ile	Asp	Ser	Gly	Leu
		305					310					315			
Tyr	Leu	Gly	Ser	Gly	Tyr	Phe	Thr	Ala	Ile	Gln	Asn	Leu	Arg	Lys	Ser
	320					325					330				
Glu	Glu	Glu	Val	Ala	Ala	Arg	Arg	Ala	Arg	Val	Val	Trp	Cys	Ala	Val
335					340					345					350
Gly	Glu	Gln	Glu	Leu	Arg	Lys	Cys	Asn	Gln	Trp	Ser	Gly	Leu	Ser	Glu
				355					360					365	
Gly	Ser	Val	Thr	Cys	Ser	Ser	Ala	Ser	Thr	Thr	Glu	Asp	Cys	Ile	Ala
			370					375					380		
Leu	Val	Leu	Lys	Gly	Glu	Ala	Asp	Ala	Met	Ser	Leu	Asp	Gly	Gly	Tyr
		385					390					395			
Val	Tyr	Thr	Ala	Cys	Lys	Cys	Gly	Leu	Val	Pro	Val	Leu	Ala	Glu	Asn
	400					405					410				
Tyr	Lys	Ser	Gln	Gln	Ser	Ser	Asp	Pro	Asp	Pro	Asn	Cys	Val	Asp	Arg
415					420					425					430
Pro	Val	Glu	Gly	Tyr	Leu	Ala	Val	Ala	Val	Val	Arg	Arg	Ser	Asp	Thr
				435					440					445	
Ser	Leu	Thr	Trp	Asn	Ser	Val	Lys	Gly	Lys	Lys	Ser	Cys	His	Thr	Ala
			450					455					460		
Val	Asp	Arg	Thr	Ala	Gly	Trp	Asn	Ile	Pro	Met	Gly	Leu	Leu	Phe	Asn
		465					470					475			
Gln	Thr	Gly	Ser	Cys	Lys	Phe	Asp	Glu	Tyr	Phe	Ser	Gln	Ser	Cys	Ala
	480					485					490				



Pro	Gly	Ser	Asp	Pro	Arg	Ser	Asn	Leu	Cys	Ala	Leu	Cys	Ile	Gly	Asp
495					500					505					510
Glu	Gln	Gly	Glu	Asn	Lys	Cys	Val	Pro	Asn	Ser	Asn	Glu	Arg	Tyr	Tyr
				515					520					525	
Gly	Tyr	Thr	Gly	Ala	Phe	Arg	Cys	Leu	Ala	Glu	Asn	Ala	Gly	Asp	Val
			530					535					540		
Ala	Phe	Val	Lys	Asp	Val	Thr	Val	Leu	Gln	Asn	Thr	Asp	Gly	Asn	Asn
		545					550					555			
Asn	Glu	Ala	Trp	Ala	Lys	Asp	Leu	Lys	Leu	Ala	Asp	Phe	Ala	Leu	Leu
	560					565					570				
Cys	Leu	Asp	Gly	Lys	Arg	Lys	Pro	Val	Thr	Glu	Ala	Arg	Ser	Cys	His
575					580					585					590
Leu	Ala	Met	Ala	Pro	Asn	His	Ala	Val	Val	Ser	Arg	Met	Asp	Lys	Val
				595					600					605	
Glu	Arg	Leu	Lys	Gln	Val	Leu	Leu	His	Gln	Gln	Ala	Lys	Phe	Gly	Arg
			610					615						620	
Asn	Gly	Ser	Asp	Cys	Pro	Asp	Lys	Phe	Cys	Leu	Phe	Gln	Ser	Glu	Thr
		625					630					635			
Lys	Asn	Leu	Leu	Phe	Asn	Asp	Asn	Thr	Glu	Cys	Leu	Ala	Arg	Leu	His
	640					645					650				
Gly	Lys	Thr	Thr	Tyr	Glu	Lys	Tyr	Leu	Gly	Pro	Gln	Tyr	Val	Ala	Gly
655					660					665					670
Ile	Thr	Asn	Arg	Lys	Lys	Cys	Ser	Thr	Ser	Pro	Leu	Leu	Glu	Ala	Cys
				675					680					685	
Glu	Phe	Leu	Arg	Lys											
			690												

(2) INFORMATION FOR SEQ ID NO:3:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 2619 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(ix) FEATURE:

- (A) NAME/KEY: sig\_peptide
- (B) LOCATION: 295..351

(ix) FEATURE:

- (A) NAME/KEY: mat\_peptide
- (B) LOCATION: 352..2430

(ix) FEATURE:

- (A) NAME/KEY: CDS
- (B) LOCATION: 295..2430

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:3:

GACTCCTAGG GGCTTGCAGA CCTAGTGGGA GAGAAAGAAC ATCGCAGCAG CCAGGCAGAA	60
CCAGGACAGG TGAGGTGCAG GCTGGCTTTC CTCTCGCAGC GCGGTGTGGA GTCCTGTCCT	120
GCCTCAGGGC TTTTCGGAGC CTGGATCCTC AAGGAACAAG TAGACCTGGC CGCGGGGAGT	180
GGGGAGGGAA GGGGTGTCTA TTGGGCAACA GGGCGGCAAA GCCCTGAATA AAGGGGCGCA	240
GGGCAGGCGC AAGTGCAGAG CCTTCGTTTG CCAAGTCGCC TCCAGACCGC AGAC ATG	297
	Met
	-19
AAA CTT GTC TTC CTC GTC CTG CTG TTC CTC GGG GCC CTC GGA CTG TGT	345
Lys Leu Val Phe Leu Val Leu Leu Phe Leu Gly Ala Leu Gly Leu Cys	
-15 -10 -5	
CTG GCT GGC CGT AGG AGA AGG AGT GTT CAG TGG TGC GCC GTA TCC CAA	393
Leu Ala Gly Arg Arg Arg Arg Ser Val Gln Trp Cys Ala Val Ser Gln	
1 5 10	
CCC GAG GCC ACA AAA TGC TTC CAA TGG CAA AGG AAT ATG AGA AAA GTG	441
Pro Glu Ala Thr Lys Cys Phe Gln Trp Gln Arg Asn Met Arg Lys Val	
15 20 25 30	
CGT GGC CCT CCT GTC AGC TGC ATA AAG AGA GAC TCC CCC ATC CAG TGT	489
Arg Gly Pro Pro Val Ser Cys Ile Lys Arg Asp Ser Pro Ile Gln Cys	
35 40 45	

ATC	CAG	GCC	ATT	GCG	GAA	AAC	AGG	GCC	GAT	GCT	GTG	ACC	CTT	GAT	GGT	537
Ile	Gln	Ala	Ile	Ala	Glu	Asn	Arg	Ala	Asp	Ala	Val	Thr	Leu	Asp	Gly	
			50					55					60			
GGT	TTC	ATA	TAC	GAG	GCA	GGC	CTG	GCC	CCC	TAC	AAA	CTG	CGA	CCT	GTA	585
Gly	Phe	Ile	Tyr	Glu	Ala	Gly	Leu	Ala	Pro	Tyr	Lys	Leu	Arg	Pro	Val	
		65					70					75				
GCG	GCG	GAA	GTC	TAC	GGG	ACC	GAA	AGA	CAG	CCA	CGA	ACT	CAC	TAT	TAT	633
Ala	Ala	Glu	Val	Tyr	Gly	Thr	Glu	Arg	Gln	Pro	Arg	Thr	His	Tyr	Tyr	
	80					85					90					
GCC	GTG	GCT	GTG	GTG	AAG	AAG	GGC	GGC	AGC	TTT	CAG	CTG	AAC	GAA	CTG	681
Ala	Val	Ala	Val	Val	Lys	Lys	Gly	Gly	Ser	Phe	Gln	Leu	Asn	Glu	Leu	
	95				100					105					110	
CAA	GGT	CTG	AAG	TCC	TGC	CAC	ACA	GGC	CTT	CGC	AGG	ACC	GCT	GGA	TGG	729
Gln	Gly	Leu	Lys	Ser	Cys	His	Thr	Gly	Leu	Arg	Arg	Thr	Ala	Gly	Trp	
				115					120					125		
AAT	GTC	CCT	ACA	GGG	ACA	CTT	CGT	CCA	TTC	TTG	AAT	TGG	ACG	GGT	CCA	777
Asn	Val	Pro	Thr	Gly	Thr	Leu	Arg	Pro	Phe	Leu	Asn	Trp	Thr	Gly	Pro	
			130					135					140			
CCT	GAG	CCC	ATT	GAG	GCA	GCT	GTG	GCC	AGG	TTC	TTC	TCA	GCC	AGC	TGT	825
Pro	Glu	Pro	Ile	Glu	Ala	Ala	Val	Ala	Arg	Phe	Phe	Ser	Ala	Ser	Cys	
		145					150					155				
GTT	CCC	GGT	GCA	GAT	AAA	GGA	CAG	TTC	CCC	AAC	CTG	TGT	CGC	CTG	TGT	873
Val	Pro	Gly	Ala	Asp	Lys	Gly	Gln	Phe	Pro	Asn	Leu	Cys	Arg	Leu	Cys	
	160					165					170					
GCG	GGG	ACA	GGG	GAA	AAC	AAA	TGT	GCC	TTC	TCC	TCC	CAG	GAA	CCG	TAC	921
Ala	Gly	Thr	Gly	Glu	Asn	Lys	Cys	Ala	Phe	Ser	Ser	Gln	Glu	Pro	Tyr	
	175				180					185					190	
TTC	AGC	TAC	TCT	GGT	GCC	TTC	AAG	TGT	CTG	AGA	GAC	GGG	GCT	GGA	GAC	969
Phe	Ser	Tyr	Ser	Gly	Ala	Phe	Lys	Cys	Leu	Arg	Asp	Gly	Ala	Gly	Asp	
				195					200					205		
GTG	GCT	TTT	ATC	AGA	GAG	AGC	ACA	GTG	TTT	GAG	GAC	CTG	TCA	GAC	GAG	1017
Val	Ala	Phe	Ile	Arg	Glu	Ser	Thr	Val	Phe	Glu	Asp	Leu	Ser	Asp	Glu	
			210					215					220			
GCT	GAA	AGG	GAC	GAG	TAT	GAG	TTA	CTC	TGC	CCA	GAC	AAC	ACT	CGG	AAG	1065
Ala	Glu	Arg	Asp	Glu	Tyr	Glu	Leu	Leu	Cys	Pro	Asp	Asn	Thr	Arg	Lys	
		225					230					235				
CCA	GTG	GAC	AAG	TTC	AAA	GAC	TGC	CAT	CTG	GCC	CGG	GTC	CCT	TCT	CAT	1113
Pro	Val	Asp	Lys	Phe	Lys	Asp	Cys	His	Leu	Ala	Arg	Val	Pro	Ser	His	
	240					245					250					

GCC	GTT	GTG	GCA	CGA	AGT	GTG	AAT	GGC	AAG	GAG	GAT	GCC	ATC	TGG	AAT	1161
Ala	Val	Val	Ala	Arg	Ser	Val	Asn	Gly	Lys	Glu	Asp	Ala	Ile	Trp	Asn	
255					260					265					270	
CTT	CTC	CGC	CAG	GCA	CAG	GAA	AAG	TTT	GGA	AAG	GAC	AAG	TCA	CCG	AAA	1209
Leu	Leu	Arg	Gln	Ala	Gln	Glu	Lys	Phe	Gly	Lys	Asp	Lys	Ser	Pro	Lys	
			275						280					285		
TTC	CAG	CTC	TTT	GGC	TCC	CCT	AGT	GGG	CAG	AAA	GAT	CTG	CTG	TTC	AAG	1257
Phe	Gln	Leu	Phe	Gly	Ser	Pro	Ser	Gly	Gln	Lys	Asp	Leu	Leu	Phe	Lys	
			290					295					300			
GAC	TCT	GCC	ATT	GGG	TTT	TCG	AGG	GTG	CCC	CCG	AGG	ATA	GAT	TCT	GGG	1305
Asp	Ser	Ala	Ile	Gly	Phe	Ser	Arg	Val	Pro	Pro	Arg	Ile	Asp	Ser	Gly	
		305					310					315				
CTG	TAC	CTT	GGC	TCC	GGC	TAC	TTC	ACT	GCC	ATC	CAG	AAC	TTG	AGG	AAA	1353
Leu	Tyr	Leu	Gly	Ser	Gly	Tyr	Phe	Thr	Ala	Ile	Gln	Asn	Leu	Arg	Lys	
	320					325					330					
AGT	GAG	GAG	GAA	GTG	GCT	GCC	CGG	CGT	GCG	CGG	GTC	GTG	TGG	TGT	GCG	1401
Ser	Glu	Glu	Glu	Val	Ala	Ala	Arg	Arg	Ala	Arg	Val	Val	Trp	Cys	Ala	
335					340					345					350	
GTG	GGC	GAG	CAG	GAG	CTG	CGC	AAG	TGT	AAC	CAG	TGG	AGT	GGC	TTG	AGC	1449
Val	Gly	Glu	Gln	Glu	Leu	Arg	Lys	Cys	Asn	Gln	Trp	Ser	Gly	Leu	Ser	
				355					360					365		
GAA	GGC	AGC	GTG	ACC	TGC	TCC	TCG	GCC	TCC	ACC	ACA	GAG	GAC	TGC	ATC	1497
Glu	Gly	Ser	Val	Thr	Cys	Ser	Ser	Ala	Ser	Thr	Thr	Glu	Asp	Cys	Ile	
			370					375					380			
GCC	CTG	GTG	CTG	AAA	GGA	GAA	GCT	GAT	GCC	ATG	AGT	TTG	GAT	GGA	GGA	1545
Ala	Leu	Val	Leu	Lys	Gly	Glu	Ala	Asp	Ala	Met	Ser	Leu	Asp	Gly	Gly	
		385					390					395				
TAT	GTG	TAC	ACT	GCA	TGC	AAA	TGT	GGT	TTG	GTG	CCT	GTC	CTG	GCA	GAG	1593
Tyr	Val	Tyr	Thr	Ala	Cys	Lys	Cys	Gly	Leu	Val	Pro	Val	Leu	Ala	Glu	
	400					405					410					
AAC	TAC	AAA	TCC	CAA	CAA	AGC	AGT	GAC	CCT	GAT	CCT	AAC	TGT	GTG	GAT	1641
Asn	Tyr	Lys	Ser	Gln	Gln	Ser	Ser	Asp	Pro	Asp	Pro	Asn	Cys	Val	Asp	
415					420				425					430		
AGA	CCT	GTG	GAA	GGA	TAT	CTT	GCT	GTG	GCG	GTG	GTT	AGG	AGA	TCA	GAC	1689
Arg	Pro	Val	Glu	Gly	Tyr	Leu	Ala	Val	Ala	Val	Val	Arg	Arg	Ser	Asp	
				435					440					445		
ACT	AGC	CTT	ACC	TGG	AAC	TCT	GTG	AAA	GGC	AAG	AAG	TCC	TGC	CAC	ACC	1737
Thr	Ser	Leu	Thr	Trp	Asn	Ser	Val	Lys	Gly	Lys	Lys	Ser	Cys	His	Thr	
			450					455					460			

GCC	GTG	GAC	AGG	ACT	GCA	GGC	TGG	AAT	ATC	CCC	ATG	GGC	CTG	CTC	TCC	1785
Ala	Val	Asp	Arg	Thr	Ala	Gly	Trp	Asn	Ile	Pro	Met	Gly	Leu	Leu	Ser	
		465					470					475				
AAC	CAG	ACG	GGC	TCC	TGC	AAA	TTT	GAT	GAA	TAT	TTC	AGT	CAA	AGC	TGT	1833
Asn	Gln	Thr	Gly	Ser	Cys	Lys	Phe	Asp	Glu	Tyr	Phe	Ser	Gln	Ser	Cys	
	480					485					490					
GCC	CCT	GGG	TCT	GAC	CCG	AGA	TCT	AAT	CTC	TGT	GCT	CTG	TGT	ATT	GGC	1881
Ala	Pro	Gly	Ser	Asp	Pro	Arg	Ser	Asn	Leu	Cys	Ala	Leu	Cys	Ile	Gly	
495					500					505					510	
GAC	GAG	CAG	GGT	GAG	AAT	AAG	TGC	GTG	CCC	AAC	AGC	AAC	GAG	AGA	TAC	1929
Asp	Glu	Gln	Gly	Glu	Asn	Lys	Cys	Val	Pro	Asn	Ser	Asn	Glu	Arg	Tyr	
				515					520					525		
TAC	GGC	TAC	ACT	GGG	GCT	TTC	CGG	TGC	CTG	GCT	GAG	AAT	GCT	GGA	GAC	1977
Tyr	Gly	Tyr	Thr	Gly	Ala	Phe	Arg	Cys	Leu	Ala	Glu	Asn	Ala	Gly	Asp	
			530					535					540			
GTT	GCA	TTT	GTG	AAA	GAT	GTC	ACT	GTC	TTG	CAG	AAC	ACT	GAT	GGA	AAT	2025
Val	Ala	Phe	Val	Lys	Asp	Val	Thr	Val	Leu	Gln	Asn	Thr	Asp	Gly	Asn	
		545					550					555				
AAC	AAT	GAG	GCA	TGG	GCT	AAG	GAT	TTG	AAC	CTG	GCA	GAC	TTT	GCG	CTG	2073
Asn	Asn	Glu	Ala	Trp	Ala	Lys	Asp	Leu	Asn	Leu	Ala	Asp	Phe	Ala	Leu	
	560					565					570					
CTG	TGC	CTC	GAT	GGC	AAA	CGG	AAG	CCT	GTG	ACT	GAC	GCT	AGA	AGC	TGC	2121
Leu	Cys	Leu	Asp	Gly	Lys	Arg	Lys	Pro	Val	Thr	Asp	Ala	Arg	Ser	Cys	
575					580					585					590	
CAT	CTT	GCC	ATG	GCC	CCG	AAT	CAT	GCC	GTG	GTG	TCT	CGG	ATG	GAT	AAG	2169
His	Leu	Ala	Met	Ala	Pro	Asn	His	Ala	Val	Val	Ser	Arg	Met	Asp	Lys	
				595					600					605		
GTG	GAA	CGC	CTG	AAA	CAG	GTG	CTG	CTC	CAC	CAA	CAG	GCT	AAA	TTT	GGG	2217
Val	Glu	Arg	Leu	Lys	Gln	Val	Leu	Leu	His	Gln	Gln	Ala	Lys	Phe	Gly	
			610					615					620			
AGA	AAT	GGA	TCT	GAC	TGC	CCG	CAG	AAG	TTT	TGC	TTA	TTC	CAG	TCT	GAA	2265
Arg	Asn	Gly	Ser	Asp	Cys	Pro	Gln	Lys	Phe	Cys	Leu	Phe	Gln	Ser	Glu	
		625					630					635				
ACC	AAA	AAC	CTT	CTG	TTC	AAT	GAC	AAC	ACT	GAG	TGT	CTG	GCC	AGA	CTC	2313
Thr	Lys	Asn	Leu	Leu	Phe	Asn	Asp	Asn	Thr	Glu	Cys	Leu	Ala	Arg	Leu	
	640					645					650					
CAT	GGC	AAA	ACA	ACA	TAT	GAA	AAA	TAT	TTG	GGA	CCA	CAG	TAT	GTC	GCA	2361
His	Gly	Lys	Thr	Thr	Tyr	Glu	Lys	Tyr	Leu	Gly	Pro	Gln	Tyr	Val	Ala	
655					660					665					670	

GGC ATT ACT AAT CTG AAA AAG TGC TCA ACC TCC CCC CTC CTG GAA GCC	2409
Gly Ile Thr Asn Leu Lys Lys Cys Ser Thr Ser Pro Leu Leu Glu Ala	
675 680 685	
TGT GAA TTC CTC AGG AAG TAAAACCGAA GAAGATGGCC CAGCTCCCCA	2457
Cys Glu Phe Leu Arg Lys	
690	
AGAAAGCCTC AGCCATTCAC TGCCCCCAGC TCTTCTCCCC AGGTGTGTTG GGGCCTTGGC	2517
TCCCCTGCTG AAGGTGGGGA TTGCCCATCC ATCTGCTTAC AATTCCTGC TGTCGTCTTA	2577
GCAAGAAGTA AAATGAGAAA TTTTGTGAT ATTCAAAAAA AA	2619

(2) INFORMATION FOR SEQ ID NO:4:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 711 amino acids
- (B) TYPE: amino acid
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: protein

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:4:

```

Met Lys Leu Val Phe Leu Val Leu Leu Phe Leu Gly Ala Leu Gly Leu
-19          -15          -10          -5

Cys Leu Ala Gly Arg Arg Arg Arg Ser Val Gln Trp Cys Ala Val Ser
      1              5              10

Gln Pro Glu Ala Thr Lys Cys Phe Gln Trp Gln Arg Asn Met Arg Lys
      15              20              25

Val Arg Gly Pro Pro Val Ser Cys Ile Lys Arg Asp Ser Pro Ile Gln
      30              35              40              45

Cys Ile Gln Ala Ile Ala Glu Asn Arg Ala Asp Ala Val Thr Leu Asp
      50              55              60

Gly Gly Phe Ile Tyr Glu Ala Gly Leu Ala Pro Tyr Lys Leu Arg Pro
      65              70              75

Val Ala Ala Glu Val Tyr Gly Thr Glu Arg Gln Pro Arg Thr His Tyr
      80              85              90

Tyr Ala Val Ala Val Val Lys Lys Gly Gly Ser Phe Gln Leu Asn Glu
      95              100             105

Leu Gln Gly Leu Lys Ser Cys His Thr Gly Leu Arg Arg Thr Ala Gly
     110              115             120             125

Trp Asn Val Pro Thr Gly Thr Leu Arg Pro Phe Leu Asn Trp Thr Gly
     130              135             140

Pro Pro Glu Pro Ile Glu Ala Ala Val Ala Arg Phe Phe Ser Ala Ser
     145             150             155

Cys Val Pro Gly Ala Asp Lys Gly Gln Phe Pro Asn Leu Cys Arg Leu
     160             165             170

Cys Ala Gly Thr Gly Glu Asn Lys Cys Ala Phe Ser Ser Gln Glu Pro
     175             180             185

Tyr Phe Ser Tyr Ser Gly Ala Phe Lys Cys Leu Arg Asp Gly Ala Gly
     190             195             200             205

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Asp	Val	Ala	Phe	Ile	Arg	Glu	Ser	Thr	Val	Phe	Glu	Asp	Leu	Ser	Asp	
				210					215					220		
Glu	Ala	Glu	Arg	Asp	Glu	Tyr	Glu	Leu	Leu	Cys	Pro	Asp	Asn	Thr	Arg	
			225					230					235			
Lys	Pro	Val	Asp	Lys	Phe	Lys	Asp	Cys	His	Leu	Ala	Arg	Val	Pro	Ser	
		240					245					250				
His	Ala	Val	Val	Ala	Arg	Ser	Val	Asn	Gly	Lys	Glu	Asp	Ala	Ile	Trp	
	255					260					265					
Asn	Leu	Leu	Arg	Gln	Ala	Gln	Glu	Lys	Phe	Gly	Lys	Asp	Lys	Ser	Pro	
270					275					280					285	
Lys	Phe	Gln	Leu	Phe	Gly	Ser	Pro	Ser	Gly	Gln	Lys	Asp	Leu	Leu	Phe	
				290					295					300		
Lys	Asp	Ser	Ala	Ile	Gly	Phe	Ser	Arg	Val	Pro	Pro	Arg	Ile	Asp	Ser	
			305					310					315			
Gly	Leu	Tyr	Leu	Gly	Ser	Gly	Tyr	Phe	Thr	Ala	Ile	Gln	Asn	Leu	Arg	
		320					325					330				
Lys	Ser	Glu	Glu	Glu	Val	Ala	Ala	Arg	Arg	Ala	Arg	Val	Val	Trp	Cys	
	335					340					345					
Ala	Val	Gly	Glu	Gln	Glu	Leu	Arg	Lys	Cys	Asn	Gln	Trp	Ser	Gly	Leu	
350					355					360					365	
Ser	Glu	Gly	Ser	Val	Thr	Cys	Ser	Ser	Ala	Ser	Thr	Thr	Glu	Asp	Cys	
				370					375					380		
Ile	Ala	Leu	Val	Leu	Lys	Gly	Glu	Ala	Asp	Ala	Met	Ser	Leu	Asp	Gly	
			385					390					395			
Gly	Tyr	Val	Tyr	Thr	Ala	Cys	Lys	Cys	Gly	Leu	Val	Pro	Val	Leu	Ala	
		400					405					410				
Glu	Asn	Tyr	Lys	Ser	Gln	Gln	Ser	Ser	Asp	Pro	Asp	Pro	Asn	Cys	Val	
	415					420					425					
Asp	Arg	Pro	Val	Glu	Gly	Tyr	Leu	Ala	Val	Ala	Val	Val	Arg	Arg	Ser	
430					435					440					445	
Asp	Thr	Ser	Leu	Thr	Trp	Asn	Ser	Val	Lys	Gly	Lys	Lys	Ser	Cys	His	
				450					455					460		
Thr	Ala	Val	Asp	Arg	Thr	Ala	Gly	Trp	Asn	Ile	Pro	Met	Gly	Leu	Leu	
			465					470					475			
Ser	Asn	Gln	Thr	Gly	Ser	Cys	Lys	Phe	Asp	Glu	Tyr	Phe	Ser	Gln	Ser	
		480					485					490				



Cys Ala Pro Gly Ser Asp Pro Arg Ser Asn Leu Cys Ala Leu Cys Ile  
 495 500 505  
 Gly Asp Glu Gln Gly Glu Asn Lys Cys Val Pro Asn Ser Asn Glu Arg  
 510 515 520 525  
 Tyr Tyr Gly Tyr Thr Gly Ala Phe Arg Cys Leu Ala Glu Asn Ala Gly  
 530 535 540  
 Asp Val Ala Phe Val Lys Asp Val Thr Val Leu Gln Asn Thr Asp Gly  
 545 550 555  
 Asn Asn Asn Glu Ala Trp Ala Lys Asp Leu Asn Leu Ala Asp Phe Ala  
 560 565 570  
 Leu Leu Cys Leu Asp Gly Lys Arg Lys Pro Val Thr Asp Ala Arg Ser  
 575 580 585  
 Cys His Leu Ala Met Ala Pro Asn His Ala Val Val Ser Arg Met Asp  
 590 595 600 605  
 Lys Val Glu Arg Leu Lys Gln Val Leu Leu His Gln Gln Ala Lys Phe  
 610 615 620  
 Gly Arg Asn Gly Ser Asp Cys Pro Gln Lys Phe Cys Leu Phe Gln Ser  
 625 630 635  
 Glu Thr Lys Asn Leu Leu Phe Asn Asp Asn Thr Glu Cys Leu Ala Arg  
 640 645 650  
 Leu His Gly Lys Thr Thr Tyr Glu Lys Tyr Leu Gly Pro Gln Tyr Val  
 655 660 665  
 Ala Gly Ile Thr Asn Leu Lys Lys Cys Ser Thr Ser Pro Leu Leu Glu  
 670 675 680 685  
 Ala Cys Glu Phe Leu Arg Lys  
 690

(2) INFORMATION FOR SEQ ID NO:5:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 26 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:5:

TCCATGGGGG TCACAAAGAA CTGGAC

26

(2) INFORMATION FOR SEQ ID NO:6:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 27 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:6:

TGAAGCTTGC TAACAGTATA TCATAGG

27

(2) INFORMATION FOR SEQ ID NO:7:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 20 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:7:

GAGGGACTCC ACAGTTATGG

20

140

(2) INFORMATION FOR SEQ ID NO:8:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 20 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:8:

GCACACAATT ATTTGATATG

20

141

(2) INFORMATION FOR SEQ ID NO:9:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 30 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:9:

CTTGCTGTGG CGGTGGTTAG GAGATCAGAC

30

142

(2) INFORMATION FOR SEQ ID NO:10:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 30 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:10:

CTCCTGGAAG CCTGTGAATT CCTCAGGAAG

30

143

(2) INFORMATION FOR SEQ ID NO:11:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 21 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:11:

ACCAAGTGCT TCCAGTGGCA G

21

144



(2) INFORMATION FOR SEQ ID NO:12:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 26 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:12:

TCCATGGGGG TCACAAAGAA CTGGAC

26

145

(2) INFORMATION FOR SEQ ID NO:13:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 27 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:13:

TGAAGCTTGC TAACAGTATA TCATAGG

27

146

(2) INFORMATION FOR SEQ ID NO:14:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 20 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:14:

GAGGGACTCC ACAGTTATGG

20

147

(2) INFORMATION FOR SEQ ID NO:15:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 20 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:15:

GCACACAATT ATTTGATATG

20

148

(2) INFORMATION FOR SEQ ID NO:16:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 27 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:16:

ATGAAACTTA TCCTCACCTG TCTTGTG

27

(2) INFORMATION FOR SEQ ID NO:17:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 30 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:17:

GGGTTTTTCGA GGGTGCCCCC GAGGATGGAT

30

150

(2) INFORMATION FOR SEQ ID NO:18:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 12 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:18:

CGTCGACAGT AC

12

151

(2) INFORMATION FOR SEQ ID NO:19:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 12 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:19:

TGTCGACGGT AC

12



(2) INFORMATION FOR SEQ ID NO:20:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 19 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:20:

CGACGTTGTA AAACGACGG

19

153

(2) INFORMATION FOR SEQ ID NO:21:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 36 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:21:

ATTGTCGACT TATCGATGGG TTGATGATCA AGGTGA

36

154

(2) INFORMATION FOR SEQ ID NO:22:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 32 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:22:

CAAATCGATT GAACTTGCAG TATCTCCACG AC

32

155

(2) INFORMATION FOR SEQ ID NO:23:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 26 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:23:

GGGATCGATC AGATTCTGTC CCCCAT

26

156

(2) INFORMATION FOR SEQ ID NO:24:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 21 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:24:

GGATCCGAGA CACAGAACAG G

21

157

(2) INFORMATION FOR SEQ ID NO:25:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 21 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:25:

GCTAATCCAT CCATCCTATA G

21

158

(2) INFORMATION FOR SEQ ID NO:26:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 21 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:26:

TTTGGAAGG ACAAGTCACC G

21

159

(2) INFORMATION FOR SEQ ID NO:27:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 21 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:27:

CTCACTTTTC CTCAAGTTCT G

21

160



(2) INFORMATION FOR SEQ ID NO:28:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 807 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:28:

GGAAGTGCCT GGAGATTAAA ATGTGAGAGT GGAGTGGAGG TTGGGTCCTG TAGGCCTTCC	60
CATCCCACGT GCCTCACGGA GCCCTAGTGC TACTCAGTCA TGCCCCCGCA GCAGGGGTCA	120
GGTCACTTTC CCATCCTGGG GGTTATTATG ACTGTTGTCA TTGTTGTTGC CATTTTTGCT	180
ACCCTAACTG GGCAGCGGGT GCTTGCAGAG CCCTCGATAC TGACCAGGTT CCCCCCTCGG	240
AGCTCGACCT GAACCCCATG TCACCCTCGC CCCAGCCTGC AGAGGGTGGG TGA CTGCAGA	300
GATCCCTTTA CCCAAGGCCA CAGTCACATG GTTTGGAGGA GATGGTGCCC AAGGCAGAAG	360
CCACCCTCCA GACACACCTG CCCCAGTGC TGGCTCTGAC CTGTCCTTGT CTAAGAGGCT	420
GACCCCAGAA GTGTTCTTGG CGCTGGCAGC CAGCCTGGAC CCAGAGCCTG GACACCCCT	480
GCGCCCCAC TTCTGGGGGC GTACCAGGAA CCGTCCAGGC CCAGAGGGCC TTCCTGCTTG	540
GCCTCGAATG GAAGAAGGCC TCCTATTGTC CTTCGTAGAG GAAGCAACCC CAGGGCCCAA	600
GGATAGGCCA GGGGGGATTC GGGGAACCGC GTGGCTCCGG CGCGGCCCGG GCTGGCTGGC	660
TGGCCCTCCT CCTGTATAAG GCCCGAGCC CGCTGTCTCA GCCCTCCACT CCCTGCAGAG	720
CTCAGAAGCG TGACCCAGC TGCAGCCATG AAGTGCCTCC TGCTTGCCCT GGCCCTCACC	780
TGTGGCGCCC AGGCCCTCAT CGTCACC	807

141

(2) INFORMATION FOR SEQ ID NO:29:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 824 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: single
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA (genomic)

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:29:

GGAAGTGTCC TGGGAGATTT AAAATGTGAG AGGCGGGAGG TGGGAGGTTG GGCCCTGTGG	60
GCCTGCCCCAT CCCACGTGCC TGCATTAGCC CCAGTGCTGC TCAGCCGTGC CCCC GCCGCA	120
GGGGTCAGGT CACTTTCCTG TCCTGGGGTT ATTATGACTC TTGTCATTGC CATTGCCATT	180
TTTGCTACCC TAACTGGGCA GCAGGTGCTT GCAGAGCCCT CGATACCGAC CAGGTCCTCC	240
CTCGGAGCTC GACCTGAACC CCATGTCACC CTTGCCCCAG CCTGCAGAGG GTGGGTGACT	300
GCAGAGATCC CTTACCCAA GGCCACGGTC ACATGGTTTG GAGGAGCTGG TGCCCAAGGC	360
AGAGGCCACC CTCCAGGACA CACCTGTCCC CAGTGCTGGC TCTGACCTGT CCTTGTCTAA	420
GAGGCTGACC CCGGAAGTGT TCCTGGCACT GGCAGCCAGC CTGGACCCAG AGTCCAGACA	480
CCCACCTGTG CCCCCGCTT TGGGGTCTAC CAGGAACCGT CTAGGCCAG AGGGGGACTT	540
CCTGCTTGGC CTTGGATGGA AGAAGGCCTC CTATTGTCCT CGTAGAGGAA GCCACCCCGG	600
GGCCTGAGGA TGAGCCAAGT GGGATTCCGG GAACCGCGTG GCTGGGGGCC CAGCCCGGGC	660
TGGCTGGCCT GCATGCGCCT CCTGTATAAG GCCCAAGCC TGCCTGTCTC AGCCCTCCAC	720
TCCCTGCAGA GCTCAGAAGC ACGACCCAG CTGCAGCCAT GAAGTGCCTC CTGCTTGCCC	780
TGGGCCTGGC CCTCGCCTGT GGCCTCCAGG CCATCATCGT CACC	824

(2) INFORMATION FOR SEQ ID NO:30:

- (i) SEQUENCE CHARACTERISTICS:  
    (A) LENGTH: 288 base pairs  
    (B) TYPE: nucleic acid  
    (C) STRANDEDNESS: single  
    (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:30:

ATCACCTTGA TCATCAACCC AGCTTGCTGC TTCTTCCCAG TCTTGGGTTC AAGGTATTAT	60
GTATACATAT AACAAAATTT CTATGATTTT CCTATGTCTC ATCTTTCATT CTTCACTAAT	120
ACGCAGTTGT AACTTTTCTA TGTGATTGCA AGTATTGGTA CTTTCCTATG ATATACTGTT	180
AGCAAGCTTG AGGTGTGGCA GGCTTGAGAT CTGGCCATAC ACTTGAGTGA CAATGACATC	240
CACTTTGCCT TTCTCTCCAC AGGTGTCCAC TCCCAGGTCC AACTGCAG	288

163

(2) INFORMATION FOR SEQ ID NO:31:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 68 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(ix) FEATURE:

- (A) NAME/KEY: misc\_feature
- (B) LOCATION: 1..3, 64..68
- (D) OTHER INFORMATION: /note= "Overhang"

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:31:

CGATACCAAG TCGCCTCCAG ACCGCAGACA TGAAACTTGT CTCCTCGTC CTGCTGTTCC	60
TCGGGGGCC	68

164

(2) INFORMATION FOR SEQ ID NO:32:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 14 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: single
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:32:

GACTGTGTCT GGCT

14

165

(2) INFORMATION FOR SEQ ID NO:33:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 16 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: double
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

- (ix) FEATURE:
  - (A) NAME/KEY: misc\_feature
  - (B) LOCATION: 1..2
  - (D) OTHER INFORMATION: /note= "Overhang"

- (ix) FEATURE:
  - (A) NAME/KEY: misc\_feature
  - (B) LOCATION: 17..20
  - (D) OTHER INFORMATION: /note= "Overhang on complementary strand"

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:33:

CGGTCGACAT CGATGC

16

166

(2) INFORMATION FOR SEQ ID NO:34:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 30 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(ix) FEATURE:

- (A) NAME/KEY: misc feature
- (B) LOCATION: -1..-4, 31..34
- (D) OTHER INFORMATION: /note= "Overhangs on complementary strand"

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:34:

CAGAAGCGTG ACCCCAGTAT CGATACCTGG

30

167

(2) INFORMATION FOR SEQ ID NO:35:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 31 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(ix) FEATURE:

- (A) NAME/KEY: misc\_feature
- (B) LOCATION: -1..-4,
- (D) OTHER INFORMATION: /note= "Overhang on complementary strand"

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:35:

CATCGATCCC TAGCACTCTG ACCTAGCAGT C

31

168



(2) INFORMATION FOR SEQ ID NO:36:

(i) SEQUENCE CHARACTERISTICS:

- (A) LENGTH: 38 base pairs
- (B) TYPE: nucleic acid
- (C) STRANDEDNESS: double
- (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(ix) FEATURE:

- (A) NAME/KEY: misc\_feature
- (B) LOCATION: 1..4
- (D) OTHER INFORMATION: /note= "Overhang"

(ix) FEATURE:

- (A) NAME/KEY: misc\_feature
- (B) LOCATION: 39..42
- (D) OTHER INFORMATION: /note= "Overhang on complementary strand"

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:36:

TCGAGCGGCC GCCGACCGG GCCGCCTCGG CCTCGCGA

38

169

(2) INFORMATION FOR SEQ ID NO:37:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 51 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: double
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

- (ix) FEATURE:
  - (A) NAME/KEY: misc\_feature
  - (B) LOCATION: 1..2
  - (D) OTHER INFORMATION: /note= "Overhang"

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:37:

CGATAACCAT GAAACTTCTT ATCCTCACCT GTCTTGTTGGC TGTGCTCTT G

51

170

(2) INFORMATION FOR SEQ ID NO:38:

- (i) SEQUENCE CHARACTERISTICS:
  - (A) LENGTH: 27 base pairs
  - (B) TYPE: nucleic acid
  - (C) STRANDEDNESS: double
  - (D) TOPOLOGY: linear

(ii) MOLECULE TYPE: DNA

(xi) SEQUENCE DESCRIPTION: SEQ ID NO:38:

CCAAGGTCTT TGAAAGGTGT GAGTTGC

27

171